PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing (day/month/year)	23.08.2004

IMPORTANT NOTIFICATION

Applicant's or agent's file reference	
9804.02/PC/PC	

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/SG 03/00065	28.03.2003	30.05.2002

Applicant
HYDROBALL TECHNICS PTE LTD

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 9804.02/PC/PC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SG 03/00065	International filing date (day/month/year) 28.03.2003	Priority date (day/month/year) 30.05.2002
International Patent Classification (IPC) or both national classification and IPC F28G1/12		
Applicant HYDROBALL TECHNICS PTE LTD		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19.08.2003	23.08.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Van Dooren, M Telephone No. +31 70 340-4097

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/SG 03/00085

I. Basis of the report

1. With regard to the elements of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-13 as originally filed

Claims, Numbers

1-8 filed with telefax on 05.04.2004

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   - ☐ the description, pages:
   - ☐ the claims, Nos.:
   - ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Document DE-B-1247359, which is considered to represent the most relevant state of the art, discloses a system for cleaning tubing, from which the subject-matter of independent claim 1 differs in that the separator comprises rectangular perforations and that the system comprises means to rotate the fluid and the cleaning balls at the outlet pipe and cooperating with said rectangular slots of the separator for increasing the number of collisions between the cleaning balls.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to remove more dirt accumulated on the surfaces of the cleaning balls after their passage through the tubing.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) as it is not known from, nor rendered obvious over the prior art.

Claims 2 - 8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

CLAIMS

1. A system for cleaning tubing used for conducting a fluid therethrough, the tubing being connected to an inlet pipe and an outlet pipe, the system having

a plurality of cleaning balls 20 for circulating with the fluid through the tubing;

a separator 12 disposed at the outlet pipe 9 and arranged to separate the cleaning balls 20 from the fluid;

a recirculating means comprising

a housing 21 arranged to collect the cleaning balls 20, the housing 21 having a first compartment 19 and second compartment 27 separated by an apertured partition 28, the apertured partition 28 arranged to allow the fluid to pass through to the second compartment 27 but not the cleaning balls 20;

a ball supply pipe 24 having an entrance 26 coupled to a first opening on the first compartment 19 of the housing 21 and an exit 3 coupled to a first opening on the inlet pipe 5;

a fluid supply pipe 25 having an entrance 2 coupled to a second opening on the inlet pipe 5 and an exit 22 coupled to a second opening on the first compartment 19 of the housing 21;

a fluid return pipe 16 having an entrance 30 coupled to an opening on the second compartment 27 of the housing 21 and an exit 14 coupled to an opening on the outlet pipe 9;

a ball return pipe 17 having an entrance 13 coupled to an opening on the separator 12 and an exit 31 coupled to a third opening on the first compartment 19 of the housing 21;

a means for supply of cleaning balls to the inlet pipe 5 whereby a high pressure is formed at the entrance 2 of the fluid supply pipe 23 and a low pressure is formed at the exit 3 of the ball supply pipe 24, the difference in pressure causing a transfer of cleaning balls 20 from the housing 21 to the inlet pipe 5; and

a means for a return of cleaning balls 20 to the housing 21 whereby a high pressure is formed at the entrance 13 of the ball return pipe 17 and a low pressure is formed at the exit 14 of the fluid return pipe 16, the difference in pressure causing a transfer of cleaning balls 20 from the separator 12 back to the housing 21

characterised in that the recirculating means, means for supply of cleaning balls and means for return of cleaning balls are arranged to selectively transfer the plurality of cleaning balls 20 from the inlet pipe 5 to the outlet pipe 9.

2. A cleaning system according to claim 1, wherein the recirculating means further comprises a first valve V1 disposed along the fluid supply pipe 23, a second valve V2 disposed along the fluid return pipe 16, a first one-way valve CV1 disposed along the ball supply pipe 24, and a second one-way valve CV2 disposed along the ball return pipe 12; the first one-way valve CV1 being operative to transfer the cleaning balls 20 from the housing 21 to the inlet pipe 5 and the second one-way valve CW2 being operative to transfer the cleaning balls 20 from the separator 12 to the housing 21.

3. A cleaning system according to claim 1 or claim 2, wherein the recirculating means further comprising a third valve HV2 disposed along the ball return pipe 17 and a fourth valve HV1 disposed along the ball supply pipe 24.

4. A means for supply of cleaning balls 20 in a cleaning system according to claim 1 or claim 2 or claim 3 operative by the opening of the first valve V1 and keeping the second valve V2 closed, creating a high pressure at the entrance 2 of the fluid supply pipe 23 and a low pressure at the exit 3 of the ball supply pipe 24, the high pressure creating a suction force to draw the fluid from the inlet pipe 5 into the housing 21 through the fluid supply pipe 23, the force of the fluid flowing through the housing 21 carrying the cleaning balls 20 from the housing 21 through the first one way valve CV1, into the ball supply pipe 24, and into the inlet pipe 5.

5. A means for return of cleaning balls 20 in a cleaning system according to claim 1 or claim 2 or claim 3 operative by the opening of the second valve V2 and the keeping of the first valve V1 closed, creating a high pressure at the entrance 13 of the ball return pipe 17 and a low pressure at the exit 14 of the fluid return pipe 16, the high pressure creating a suction force to draw the fluid and the cleaning balls 20 from the separator 12 through the second one way valve CV2 and into the ball return pipe 17, the force of the fluid carrying the cleaning balls 20 through the second one-way valve CV2, into the ball return pipe 17 into the housing 21, wherein said cleaning balls 20 are retained in the housing 21 while the fluid flows through the apertured partition 28 in the housing 21 to return to the fluid return pipe 16 and into the outlet duct 15.

6. A cleaning system according to any one of the preceding claims, wherein the separator 12 is in a shape of a funnel.

7. A cleaning system according to claim 6, wherein the separator 12 comprises perforations which allow the fluid to flow through but not the cleaning balls 20.

8. A cleaning system according to claim 7, wherein the perforations are in the form of rectangular slots 32 each having a length direction.

9. A cleaning system according to claim 8, wherein the length directions of the rectangular slots 32 are not parallel to the centre axis of the funnel.

10. A cleaning system according to any one of the preceding claims, further comprising means 4 to rotate the fluid and the cleaning balls 20 at the inlet pipe 5 before the tubing 8.

11. A cleaning system according to any one of the preceding claims, further comprising means 10 to rotate the fluid and the cleaning balls 20 at the outlet pipe 9 before the separator 12.

12. A cleaning system according to claim 9 or claim 10, and dependent on claim 11, wherein the direction of the rotational means is opposite to the length direction of the rectangular slots 32.